

Lake Management Plan

Goose Lake

Adams County, WI

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Introduction

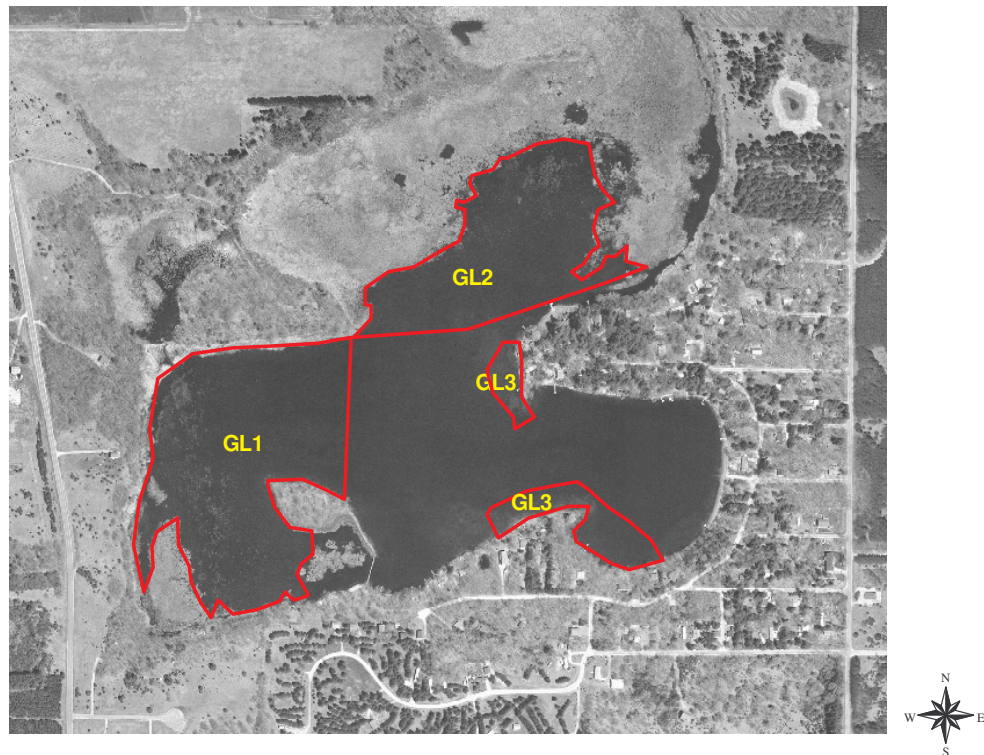
Goose Lake

Background

Goose Lake is located in Jackson Township, Adams County, Wisconsin. Goose Lake is 81 acres and has a maximum depth of 18 feet, and mean depth of 7 feet. It has 2.1 miles of shoreline. Goose Lake is a seepage lake with no inlet or outlet.

The Wisconsin Department of Natural Resources (DNR) established two Critical Habitat Areas in 2001. These zones were established to protect the shoreline and shallow water plant species of Goose Lake's western and northern shores. In 2006, the critical habitat was revised to include a third area. The map below shows where these areas, labeled GL1, GL2 and GL3 are located. GL1 is 21.45 acres with an average depth of 5'. GL2 is 19.42 acres averaging 6.5' in depth. GL3 is 2.01 acres by the point and 4.86 acres along the southeast shore. GL3 has an average depth of 3.5'.

Revised Critical Habitat Areas--Goose Lake



RE:9/06

Natural shoreline buffers exist on the northern shoreline of the lake. This provides excellent habitat for wintering of amphibians and aquatic invertebrates. Most of this area is undeveloped. The northern shore of GL2 is completely undeveloped and it is wetlands.

The most developed shoreline is along the northeast side of the lake. Along the south and west shores there are areas of wooded and wetland shores that are also developed.

Water quality was measured by Adams County Land and Water Conversation Department 2004-2006. The data indicates Goose Lake's water would favor moderate plant growth, occasional algal blooms and good water clarity. More information on the water quality measurements can be found in Appendix A, THE AQUATIC PLANT COMMUNITY FOR GOOSE LAKE, ADAMS COUNTY 2006.

Recreational Use

Goose Lake serves a variety of recreational purposes, including boating, fishing, ice fishing, swimming and waterfowl hunting. More passive forms of recreation such as walking, picnicking and wildlife watching are also popular.

There is a public boat landing that is maintained by Jackson Township. Parking areas are not established so patrons utilize roadside areas for parking automobiles and trailers while visiting the lake. Boating activities included power boating, sail boating and canoeing.

There is also a public beach and swimming area consisting of 150 feet of shoreline that is owned and maintained by the township.

The lake supports self sustaining populations of largemouth bass, northern pike, and panfish and to a lesser degree crappie and rough fish.

Goose Lake Improvement Association

Goose Lake Improvement Association was formed in 1956. In 2004 the Association was recognized as a Qualified Lake Association by the DNR. The purpose of the Association is to maintain, protect and enhance the quality of the public waterway and shoreline known as Goose Lake, for the collective interests of the members and surrounding residents. To carry out the best management practices of lake stewardship and to make representation on behalf of its members, the Association is organized as a non-profit, nonstock corporation under Chapter 181 of Wisconsin Statutes.

Goals and Objectives

The Association desires to:

1. Control exotic and nuisance plant species by annual aquatic plant control.

2. Protect critical habitat by following DNR and ACLWCD recommendations contained in Appendix B, CRITICAL HABITAT DESIGNATION For Goose Lake, Adams County 2006 where feasible.
3. Inform the public at the boat launch information board on the importance of critical habitat and inform the lake residence at association meetings and news mailings.
4. Preserve native plants by conducting periodic plant surveys every 3-5 years to identify species and location to incorporate findings in the annual aquatic plant control plan.
5. Provide an excellent habitat for fish through winter aeration of the lake to protect fish from oxygen depletion caused by rapid plant decay in winter months.
6. Periodic stocking of fish in conjunction with DNR Fish Management, maintain natural shoreline vegetation by DNR guidelines and shoreline ordinances.
7. Provide an excellent habitat for wildlife by educating owners of shoreline with printed material and speakers at the association meetings on the value of natural habitat for wildlife.
8. Maintain the quality of the lake in compliance with shoreline use ordinances.
9. Provide a safe and nuisance free environment for swimming through the placement of buoys to designate a swimming area protected from boat traffic from the end of May to the beginning of September.
10. Provide improved navigation for boating and edge habitat for fish by reducing aquatic plant density in boating channels.
11. Educate homeowners on the value of a natural habitat for water quality and on how to control the spread of invasive plant species through literature, news letters to residents and members in the area of the lake, speakers at association meetings and postings at the public launch information board.

The Association collects voluntary dues from area residents to fund improvement projects for the lake. The dues have funded projects such as:

- Annual aquatic plant control through harvesting or herbicide treatment
- Annual aeration of the lake to protect fish from oxygen depletion caused by rapid plant decay in winter months.
- Periodic stocking of fish in conjunction with DNR Fish Management
- The purchase of bouys to designate a swimming area protected from boat traffic.
- Producing and distributing an annual newsletter

Financial Information

Goose Lake Improvement Association collects membership dues and contributions on a voluntary basis. For lake front properties the requested amount is \$200, for others it is \$75. Of those amounts \$20 are membership dues. The table that follows shows the income and expenses incurred by the Association over the last 6 years.

Goose Lake Improvement Association Income and Expense Summary							
Year	Income	Weed Control Expense	Electricity	Insurance	Other Exp	Total Expense	Over / (Short)
2001	7,250	7,876	344	609	363	9,193	(1,943)
2002	10,025	7,900	321	682	298	9,201	824
2003	9,337	8,925	427	756	754	10,862	(1,525)
2004	10,313	5,936	512	779	166	7,393	2,920
2005	7,747	4,665	407	781	1,074	6,927	820
2006	8,385	5,600	476	781	260	7,117	1,268
Total	74,837	58,591	2,487	4,388	2,915	50,693	2,364

Management Plan

The management plan is consistent with Goose Lake Improvement Association's goals and objectives.

Aquatic Plant Management

The aquatic plant management plan is designed to significantly reduce, and control the spread of exotic plants, and control nuisance native plant growth.

There is a long history of aquatic plant control on Goose Lake. From 1968 through 2004, various herbicide treatments were used for aquatic plant control on Goose Lake. They are outlined in the following chart.

	Aquathol-K	2,4-D	Reward	NuFarm Weedar 64	Cutrine +	K-Tea	CuSO4	Diquat
1968							230 lbs	
1972	300 lbs						200 lbs	
1977	20 gal	22 gal			4 gal			4 gal
1978	28 gal	4.5 lbs			13.5 gal			6 gal
1979	38 gal				17 gal			
1981	30 gal				15 gal			
1982							50 lbs	16 gal
1983	35 gal				10 gal			
1984	35 gal							
1986	35 gal							
1987	600 lbs							
1996	4.5 gal	10 lbs	4.5 gal		4.5 gal			
1997	30 gal	22.5 lbs	12 gal				60 lbs	
1998	4 gal	13.625 lbs						
1999	24 gal		1 gal			15 gal		
2000	37.5 gal				35 gal			
2001	5 gal	1.75 lbs	3 lbs					
2004				74 gal				
total	326 gal	22 gal	17.5 gal	74 gal	99 gal	15 gal	540 lbs	26 gal
	900 lbs	52.375 lbs	3 lbs					

The Goose Lake Improvement Association was mechanically harvesting aquatic plants (primarily pondweed) from 1988 to 1995. Volume metric records of plant removal were not documented during that time frame.

In 1996, the Association returned to chemical treatment in order to control the spread of *Brasenia schreberior* (Watershield) and to seek lower cost methods of creating boat navigation channels through the pondweed. Good progress was made in controlling Watershield, but the results of pondweed treatments were poor after the first year.

The Association resumed mechanical harvesting of aquatic plants in 2001 and has continued through 2006. (2006 figures are not yet available.) The plants removed were not tested for Total Phosphorous (TP) or other nutrients.

Year	Lbs Removed
2001	92,000
2002	243,800
2003	242,000
2004	90,000
2005	19,500
total	687,300

In 2004, chemical treatment was done to control EWM in addition to harvesting. Fair to good results were achieved on the EWM colonies treated that year, but not all colonies present in the lake were included in the treatment. The areas treated in 2004 were re-colonized the following year.

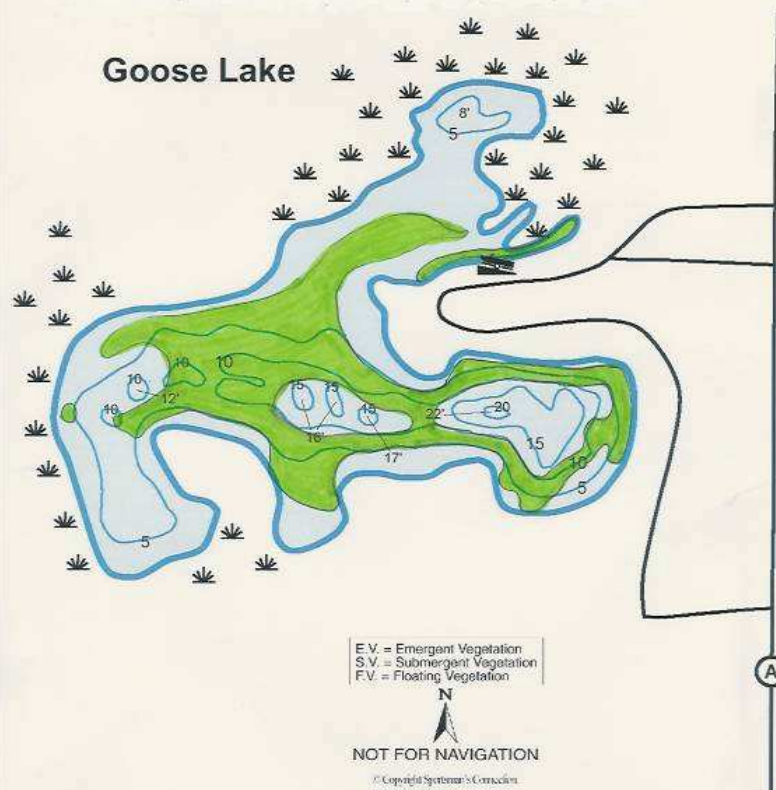
Aquatic Plant Survey

An aquatic plant survey was conducted on Goose Lake in July 2006 by the DNR and ACLWCD. The survey results were documented in Appendix A, THE AQUATIC PLANT COMMUNITY FOR GOOSE LAKE, ADAMS COUNTY 2006

Goose Lake has historically had an abundance of pondweed that interferes with recreational use of the lake. The pondweed was primarily controlled through mechanical harvesting to open areas of the lake for recreation. The pondweed is giving way to an invasive strain of milfoil over the past 4-5 years.

Goose Lake is now suffering from a significant infestation of Eurasian Water Milfoil (EWM). The following map identifies the EWM concentrations in green. EWM in total has impacted 32.5 acres of Goose Lake. The survey was conducted by Wisconsin Lake and Pond Resource, LLC. This is further supported by the aquatic plant survey conducted by the DNR and ACLWCD and documented in Appendix A.

Approximate distribution of Eurasian watermilfoil
on October 19, 2006. 32.5 acres total.



Aquatic Plant Management Options

The Management Options for Aquatic Plants created by the University of Wisconsin Extension, Lakes Program which is part of the Wisconsin Lakes Partnership, was referenced in creating the Aquatic Plant Management Plan for Goose Lake.

A description and list of pros and cons of each option are included in the document which is included as Appendix C of the Goose Lake Management Plan.

The application of the specific management options at Goose Lake will follow the guidelines identified in the following section for exotic and nuisance native plant control at Goose Lake.

Exotic and Nuisance Native Plant Control Guidelines for Goose Lake

Exotic and native nuisance plant control at Goose Lake will only employ methods recommended by the DNR and Adams County Land and Water Conservation Department (ACLWCD) for elimination or control of the exotic plant and nuisance native plant species. These methods may include:

1. Selective and systemic herbicide application
2. Mechanical harvesting
3. Removal through hand pulling or mechanical plant removal techniques
4. Dredging
5. Biological control

Permits must be obtained from the DNR for all herbicide applications and mechanical harvesting or removal operations. Hand removal may be done without a permit only when within the DNR guidelines as published in NR109.06.

The method of control selected must provide a measurable improvement in reducing the presence of the exotic plant or controlling the spread of nuisance native plants within three years. If an improvement is not measured then this method should be abandoned in favor of alternative methods if they exist.

Herbicide Application

Herbicide application will only be used to control exotic and nuisance native plants when:

- biological controls are not available or affordable,
- mechanical harvesting controls are not available or affordable. For example when the plants are located in areas too shallow for harvesting; or the plant's ability to rebound quickly from the harvesting operation make it economically impractical to control through harvesting;
- hand pulling is not practical;
- the application is selective and systemic;

- or when recommended by the DNR as the preferred method of treatment for the particular plant species.

Herbicides, when used, must be approved by the EPA for use in similar applications and must follow manufacturer application guidelines. Organic and biodegradable herbicides will be used whenever they are available for the plant species. Non-organic and non-biodegradable herbicides will only be used when organic and biodegradable herbicides are not available and the DNR and ACLWCD recommend herbicide treatment as the only effective method of control for the particular plant species.

Advantages

- 1) Relatively little effort involved
- 2) Can use selective product or timing for some species

Disadvantages

- 1) Risk associate with adding chemical to the lake
- 2) Toxic to portions of the lake ecosystem
- 3) Water use restrictions for some products
- 4) Can take up to 2-3 weeks to see result
- 5) Not as effective in deeper or flowing water
- 6) Plants decay in water, adding to nutrient load and algae blooms
- 7) Plants decay in water, using oxygen
- 8) Plants decay in water, enriching sediments in treatment areas (sand turns to silt and muck)

Mechanical Harvesting

Mechanical harvesting will be used to control exotic and nuisance native plants when:

- permitted,
- economically practical,
- biological controls are not available or affordable,
- recommended by the DNR and ACLWCD,
- and the harvesting operation will not induce further spread of the exotic or native nuisance plant through “floaters”, or loose spoils of the harvesting process.

Advantages

- 1) Immediately opens areas for water use
- 2) No water use restrictions
- 3) Can be selective in timing for some species
- 4) Removes nutrients from the lake
- 5) Most effective in deeper water

Disadvantages

- 1) May require multiple cuttings
- 2) Not selective during the middle of the summer
- 3) Can create fragments, depending on speed and care of operator.*
- 4) Can not operate in water less than 3feet deep

*Note that boats can also create fragments. If the EWM is located in boating channels, harvesting can result in less fragmentation than leaving the colony unharvested due to the impact the boats will have.

Hand Pulling or Mechanical Plant Removal

Hand pulling of exotic and nuisance native plants as a control method can be done by shoreline property owners without a permit as long as it is done within an area not more than 30 feet wide, perpendicular to the shoreline. The property owner's pier must be located within, or next to, the 30 feet. Exotic, invasive species can be hand pulled from anywhere in the lake as long as they are selectively removed.

Hand pulling techniques include the use of a garden rake, a cutting rake, wading and pulling by hand, and using Scuba diving or snorkeling in deeper waters. When hand pulling aquatic plants, all plant fragments must be gathered and removed. When dealing with exotic plants, the entire root and all fragments of the plant should be removed.

Advantages

- 1) Immediately opens areas for water use
- 2) No water use restrictions
- 3) Is the most selective method
- 4) Removes nutrients from the lake
- 5) Most effective in shallow water
- 6) Does not require a permit if follow guidelines in NR109

Disadvantages

- 1) May require multiple pullings/cuttings
- 2) Most time intensive (can be hired out)
- 3) Not easily done in deep water without SCUBA or snorkeling gear

Dredging

Dredging will be considered when removal of sediment promoting exotic or nuisance native plant growth, or when creating water depths that prevent plant growth will provide long term control. Dredging will only be performed after studying the environmental impact of the dredging operation and with the cooperation and permit approval from the DNR and ACLWCD.

Advantages

- 1) Long term control by deepening areas beyond the photic zone and removing plant roots and seed bank
- 2) Reduces plant growth and deepens shallow areas for navigation

Disadvantages

- 1) Likely most expensive method for plant control
- 2) Can have significant, temporary impact to water clarity
- 3) Requires sediment testing for toxics in sediment and disposal as hazardous waste if tests reveal toxics

Biological Control

Biological control includes herbivores and bacteria. Currently the most common biological control is the Galerucella beetle, which is used to control the invasive plant Purple Loosestrife which has been identified in critical habitat area GL1 on Goose Lake.

The Milfoil Weevil is used to control the invasive plant EWM which has been identified in all Critical Habitat zones and in non-Critical Habitat areas of Goose Lake.

It is illegal to transport or stock carp or crayfish in Wisconsin. These are not considered viable methods of Biological control of aquatic plants.

Biological control, when available and affordable, will be a preferred method of aquatic and shoreline plant control at Goose Lake.

Advantages

- 1) Long term control with least effort if weevils are found in the lake or stocked
- 2) Least expensive long-term if successful
- 3) Using a natural control with little risk to ecosystem
- 4) If found, weevils can be raised by lake groups, schools or youth groups to augment the population

Disadvantages

- 1) Could be a high initial investment if weevils must be stocked
- 2) Requires appropriate habitat for long-term success (natural shoreline for winter hibernation, balanced fishery so that weevils are not overly preyed upon by panfish)
- 3) May take a few years for weevil populations to reach levels that can control the EWM.

Analysis

There are two major concerns regarding aquatic plants at Goose Lake identified in the DNR and ACLWCD plant survey report (Appendix A). First is the extensive colonization of EWM. Second is the density of aquatic plants at Goose Lake.

Eurasian Water Milfoil (EWM)

Mechanical harvesting of aquatic plants was done during the same timeframe that EWM spread throughout the lake. It is logical to conclude that the harvesting operation has been unsuccessful in controlling the spread of EWM.

To be successful in controlling EWM harvesting must be done 3 times per year at specific intervals that coincide with growth cycles. The harvesting operation must also target all areas of the lake where EWM has colonized. With the presence of EWM in Critical Habitat areas, and the funds available through the GLIA neither of these requirements can be met.

Harvesting is only a selective method of control in the early spring when the growth cycle of the EWM is ahead of other native plants, like pondweed, watershield and water lily's at Goose Lake. At other times, harvesting for EWM in Critical Habitat areas may result in a negative impact on plants of special concern if they are located in the harvester's path.

Member contributions have provided funding for approximately 50 hours of commercial harvesting operation each year. Experience with a number of commercial harvesters has shown that more than 30 hours of operation are required to harvest the main boating channels once. The acreage of the main boating channels is approximately 26 acres, which is less than the 32.5 acres of current EWM infestation. The 3 times per year required to control EWM would be unfeasible.

Other options of control are:

- Drawdown
- Hand Pulling
- Biological control
- Herbicide treatment

Drawdown is not a feasible option for Goose Lake because it is a seepage lake, with no inlet or outlet.

Hand pulling is not feasible because of the amount of EWM present, and the water depths at which it is found. There are 32.5 acres of EWM and the cost of labor to hand pull and dispose of this volume of plant material is cost prohibitive.

Biological control, using the Milfoil Weevil is an option to control EWM. It does this by placing its larvae in the stalks of the EWM, effectively stopping the flow of nutrients the plant needs to survive and killing it. Research on this alternative is still being conducted by state agencies. Studies have shown that the Milfoil weevil population needs to reach 90% of the number of EWM stalks to significantly reduce the infestation of EWM. Given the high colonization level of EWM in Goose Lake and the population of the weevil required to control it, the Milfoil Weevil is not feasible for short term control of EWM. It is something to be investigated for long term control, when more information is available. There is a study being conducted in August 2007 on Goose Lake to measure the presence of the Milfoil weevil in Goose Lake. The results of that study will provide information relative to the habitat's natural ability to sustain Milfoil Weevil populations.

Herbicide application of 2,4D has proven to be effective in controlling EWM and in reducing its presence. The advantages of this method of control are that it is selective and systemic meaning that it will kill the EWM, while leaving other aquatic plants intact. It has been effective at controlling EWM at other lakes in the county. It is affordable and available now. The disadvantages for Goose Lake are that it will decrease oxygen levels as dying plants decay and the dead plant material will create more nutrients in the lake that will result in algal blooms. In spite of the disadvantages, this is a feasible method of controlling the spread of EWM and can reduce its presence in Goose Lake.

Density of Aquatic Plants

As stated in the Appendix A, The percent plant cover is 100% which is over the recommended vegetation cover for optimum fishery (50%-85%). Methods of reducing plant cover include:

- Mechanical Harvesting
- Hand Pulling
- Biological control
- Herbicide treatment

Mechanical harvesting can remove plant material from the lake, although it will not reduce plant cover from bottom surfaces. Harvesting is feasible to reduce plant cover from the upper three to five feet of water depth based on permit restrictions and commercial, mechanical harvester capabilities. The disadvantage of this method is that it is not selective, meaning that all plants in the harvesters path will be cut. Harvesting operations in critical habitat areas require special consideration and may not be permitted if it will impact plants of special concern in Critical Habitat zones.

Hand Pulling can be done to reduce plant cover in the lake. It has the advantage over harvesting in that plants can be selectively, hand pulled. This allows removal of exotic and native nuisance plants to reduce cover while preserving beneficial native plant species. The disadvantage is that it is more difficult to remove plant cover in water greater than 5 feet in depth. At greater depths Scuba diving and snorkeling may be required and with the specialize labor involved could be much more costly than harvesting. Still this is a feasible method of reducing plant cover at Goose Lake, especially in shallow water.

The feasibility of biological control for reducing plant cover at will not be know until after the 2007 study.

Herbicide treatment can be done to reduce exotic species plant cover. A selective, systemic herbicide has the advantage of being able to target specific plants. The disadvantages of herbicide treatment are that it will decrease oxygen levels as dying plants decay and the dead plant material will create more nutrients in the lake that will result in algal blooms. In spite of the disadvantages, this is a feasible method of reducing plant cover.

Recommendations

Eurasian Water Milfoil (EWM)

Goose Lake Improvement Association recommends herbicide control of EWM in the short term. When EWM populations have been reduced and when more information is available on the feasibility of sustaining effective biological control of EWM at Goose Lake, the plan will consider a switch to biological control.

Goose Lake Improvement Association will initiate a specific project to control and reduce the presence of EWM in Goose Lake with herbicide treatment.

Description of the EWM project goals and objectives

The primary goal of the project is:

- to reduce the presence of EWM in Goose Lake to a level that is 10% or less of the present infestation, or 3 acres or less. With that goal met, Goose Lake can implement a monitoring treatment program for any EWM found in the future.

Description of project methods and activities

The project will survey and locate concentrations of Eurasian Water Milfoil. The survey will map locations using GPS. The survey was conducted in November, 2006. In April 2007, or when EWM has first started growing and before it reaches the surface, a selective, systemic herbicide will be applied to each acre of Eurasian Water Milfoil concentration. A pellet form of 2,4D will be used. 4-6 weeks after application the treated areas will be inspected to measure effectiveness of the herbicide application. Any problem areas will be retreated. In August, another survey will be conducted to remap the areas of Eurasian Water Milfoil. This survey will be used for the following year's treatment plan.

Goose Lake Improvement Association will develop a Citizen Lake Monitoring Network to monitor for invasive species and develop strategies including education and monitoring activities.

Goose Lake Improvement Association will implement a "Clean Boats, Clean Waters" (<http://www.uwsp.edu/cnr/uwexlakes/CBCW>) program. This program actively informs lake front property owners and public boat landing users of the need to prevent the spread of aquatic invasive species.

Description of project products or deliverables

The project will use Navigate, a 2,4d chemical delivered in pellet form. 100lbs of Navigate will be applied per acre of Eurasian Water Milfoil.

Description of data to be collected by the project

A survey of Eurasian Water Milfoil locations in Goose Lake has been plotted. It contains the specific areas where Eurasian Water Milfoil has been detected and the number of acres. The survey will be repeated after the herbicide application is conducted.

Project timetable of key activities

The treatment plan to establish control of EWM in Goose Lake is a four year plan. It is based on the following assumptions.

1. It will take two years of selective, systemic herbicide treatment to reduce EWM in infected areas. The first year will target adult plants. The second year will be required over the same area to control seedlings that have developed from seed droppings in the year prior to the initial treatment. Because the EWM has gone to

- seed in many areas of the lake only 25% reduction in the number of acres is anticipated after the first year.
2. There will be a 50% reduction per year in the number of acres infested after the second year.

The acreage to be treated each year by the project is:

Year 1	2007	32.5 acres
Year 2	2008	24.4 acres
Year 3	2009	12.2 acres
Year 4	2010	6.1 acres

Beyond 2010, Goose Lake Improvement Association will monitor and treat any new infestations each year.

Each year the project will following conduct these activities

October 2006	Eurasian Water Milfoil Survey (completed)
January 2007	File permits for herbicide control
April or May 2007	Herbicide application of EWM for 32.5 acres surveyed
June-July 2007	Measure effectiveness and re-treat permitted area as required
August 2007	Resurvey the lake for Eurasian Water Milfoil and report on effectiveness of treatment
2008-2010	Repeat above steps until Eurasian Water Milfoil controlled in all areas of the lake. Once it is controlled, establish a monitoring program and apply herbicides (under applicable permit) or pull when it is detected

Plan for sharing project results

A survey will be conducted in August that will map areas of Eurasian Water Milfoil infestations. The maps will be sent to Wisconsin Department of Natural Resources and to Adams County Land and Water Conservation Department in the fall of each year along with a letter indicating new areas of infestation detected and summarizing the effectiveness of the herbicide application.

Density of Aquatic Plants

Goose Lake Improvement Association recommends mechanical harvesting and hand pulling of aquatic plants to reduce plant density to a level of 85% or less.

Mechanical harvesting will be done to reduce plant material from the water depths of 3 feet or more. Because of the heavy plant cover in Goose Lake all areas that are greater than 5 feet in depth, more than 100 ft from shore, and not in Critical Habitat will be targeted for mechanical harvesting. Mechanical harvesting will need to be performed 2-3 times per year to be effective.

Hand pulling is also recommended to reduce plant material. This should be the method used in Critical Habitat areas where selective plants can be pulled to reduce plant density. Exotic plants can be pulled without a permit regardless of where they are located. However, hand pulling of native plants in Critical Habitat areas as a means to reduce plant density will only be done in conjunction with specific DNR recommendations for the area and will require a permit. Hand pulling is also a method that can be used by property owners, following the DNR guidelines for plant removal at docks of up to 30 feet wide areas.

General Recommendations

Goose Lake Improvement Association will follow the recommendations for Critical Habitat in zones GL1, GL2 and GL2 contained in Appendix B, CRITICAL HABITAT DESIGNATION For Goose Lake, Adams County 2006 where feasible.

Due to cost constraints Goose Lake Improvement Association may not be able to fund both control of EWM and reducing plant cover in the same calendar year. When this occurs priority will be placed on controlling EWM.

If other exotic plants colonize Goose Lake in the future, control and reduction of that species will also become a priority and treatment methods will follow the Exotic and Native Nuisance Plant Control Guidelines for Goose Lake outlined in this document.

Goose Lake Improvement Association should maintain it's status as a Qualified Lake Association and apply for Aquatic Invasive Species (AIS) Grants to assist with the financial burden of reducing and controlling exotic and invasive plant species in Goose Lake.

Goal / Action	Responsible Parties	Timeline
Significantly reduce the presence of and control the spread of EWM through selective and systemic herbicide treatment.	GLIA ACLWCD DNR	2007-2009
Conduct milfoil weevil survey in Goose Lake to determine if biological controls could be an effective option.	ACLWCD	2007
Control exotic and nuisance plant species by annual aquatic plant control through harvesting or herbicide treatment.	GLIA ACLWCD DNR	Ongoing
Protect critical habitat areas by instructing the public at the boat launch information board on the	GLIA ACLWCD	2007-2010

need for these areas and inform the lake residence at association meetings and news mailings.	DNR	
Preserve native plants by conducting periodic plant surveys to identify species and location.	ACLWCD	2008-2010
Provide improved navigation for boating and edge habitat for fish by reducing aquatic plant density in boating channels.	GLIA DNR	Ongoing
Property owners hand pull or hire individuals to hand pull aquatic plants if needed to improve their access to the lake. (No permit required if harvesting a maximum 30 feet wide area next to their dock.	GLIA	Ongoing
Educate homeowners on the value of a natural habitat for water quality and on how to control the spread of invasive plant species through literature, news letters to residents and members in the area of the lake, speakers at association meetings and postings at the public launch information board.	GLIA ACLWCD DNR	2007-2010
Develop a Citizen Lake Monitoring Network to monitor for invasive species and develop strategies including education and monitoring activities.	GLIA ACLWCD DNR	2007-2010
Implement a “Clean Boats, Clean Waters” Program.	GLIA ACLWCD DNR	2007-2010

Water Quality

The trophic state of a lake is a classification of water quality (see Table 1). Phosphorus concentration, chlorophyll a concentration and water clarity data are collected and combined to determine a trophic state. *Eutrophic lakes* are very productive, with high nutrient levels and large biomass presence. *Oligotrophic lakes* are those low in nutrients with limited plant growth and small fisheries. *Mesotrophic lakes* are those in between, i.e., those which have increased production over oligotrophic lakes, but less than eutrophic lakes; those with more biomass than oligotrophic lakes, but less than eutrophic lakes; those with a good and more varied fishery than either the eutrophic or oligotrophic lakes.

The limiting factor in most Wisconsin lakes, including Goose Lake, is phosphorus. Measuring the phosphorus in a lake system thus provides an indication of the nutrient level in a lake. Increased phosphorus in a lake will feed algal blooms and also may cause excess plant growth. The 2004-2006 summer average phosphorus concentration in Goose Lake was 16 ug/l. This is below the 25 ug/l average for natural lakes. This concentration suggests that Goose Lake is likely to have some nuisance algal blooms, but not frequent ones. This places Goose Lake in the “good” water quality section for natural lakes and in the mesotrophic level for phosphorus.

Chlorophyll concentrations provide a measure of the concentration of algae in a lake's water. Algae are natural and essential in lakes, but high algal populations can increase water turbidity and reduce light available for plant growth. The 2004-2006 summer average chlorophyll concentration in Goose Lake was 3.23 ug/l. This is very low, placing Goose Lake at the oligotrophic level for chlorophyll a results.

Water clarity is a critical factor for plants. If plants receive less than 2% of the surface illumination, they won't survive. Water clarity can be reduced by turbidity (suspended materials such as algae and silt) and dissolved organic chemicals that color or cloud the water. Water clarity is measured with a Secchi disk. Average summer Secchi disk clarity in Goose Lake in 2004-2006 was 6.85'. This is good clarity, putting Goose Lake into the mesotrophic category for water clarity.

It is normal for all of these values to fluctuate during a growing season. They can be affected by human use of the lake, by summer temperature variations, by algae growth & turbidity, and by rain or wind events. Phosphorus tends to rise in early summer, then decline as late summer and fall progress. Chlorophyll a tends to rise in level as the water warms, then decline as autumn cools the water. Water clarity also tends to decrease as summer progresses, probably due to algae growth, then increase as fall approaches.

Table 1: Trophic States				
Trophic State	Quality Index	Phosphorus	Chlorophyll a	Secchi Disk
		(ug/l)	(ug/l)	(ft)
Oligotrophic	Excellent	<1	<1	>19
	Very Good	1 to 10	1 to 5	8 to 19
Mesotrophic	Good	10 to 30	5 to 10	6 to 8
	Fair	30 to 50	10 to 15	5 to 6
Eutrophic	Poor	50 to 150	15 to 30	3 to 4
Goose Lake		16	3.23	6.85

According to these results, Goose Lake scores as “*mesotrophic*” in its phosphorus and Secchi disk levels and “*oligotrophic*” in chlorophyll a readings. This state would favor moderate plant growth, occasional algal blooms and good water clarity.

Water Quality Monitoring

GLIA will be involved in the DNR Self-Help Monitoring program and utilize citizen volunteers to monitor water quality. GLIA volunteers will conduct water clarity monitoring through Secchi Disk samplings. A summary of the reading will be published annually in newsletters and will be entered in the Citizen Lake monitoring databases.

In addition homeowners will be educated on the importance of a natural habitat to water quality and on the impact they have in maintaining water quality through lawn care practices, landscaping and septic system maintenance.

Goal / Action	Responsible Parties	Timeline
Participate in the DNR Self-Help Monitoring program.	GLIA DNR	2007-2010
Monitor water clarity with Secchi Disk and publish information in annual newsletters and distribute annual updates to interested agencies.	GLIA ACLWCD DNR	2007-2010
Conduct bi-annual water quality sample analysis	ACLWCD	2008-2010
Educate homeowners on the value of a natural habitat for water quality and on how to control the spread of invasive plant species through literature, news letters to residents and members in the area of the lake, speakers at association meetings and postings at the public launch information board.	GLIA ACLWCD DNR	2007-2010

Shoreline Buffer Zones

All riparian homeowners will be encouraged to create shoreline buffer zones to reduce soil erosion and nutrients from entering the lake. Goose Lake Improvement Association will conduct educational awareness campaigns to inform and instruct homeowners on the benefits and implementation of shoreline buffer zones.

In order to maintain as much natural shoreline as possible, GLIA will represent interests in keeping the northern shoreline undeveloped.

Goal / Action	Responsible Parties	Timeline
Provide an excellent habitat for wildlife by educating shoreline owners with printed material and speakers at the association meetings on the value of natural habitat for wildlife.	GLIA ACLWCD DNR	2007-2010
Encourage restoration of shoreline buffer zones.	GLIA ACLWCD DNR	2007-2010
Abide by and enforce shoreline ordinances.	GLIA ACLWCD DNR	Ongoing
Create a demonstration shoreline restoration site by installing a buffer zone using native plants	GLIA ACLWCD	2007-2008
Investigate the purchase of a conservation easement for the north shore undeveloped area.	GLIA ACLWCD	2008-2010

Boat Launch and Boat Use

The boat launch is owned and maintained by Jackson Township. Water runoff from the nearby street enters the lake by following the asphalt path to the boat launch area. The boat launch is made of 10' x 1.5' slabs of concrete separated by approximately 6 inches. There are 5 slabs of which 4 are broken and dislodged. Rebar is exposed. The area between the slabs and the rest of the ramp into the water is filled with gravel. The gravel erodes from the water runoff and leaves trenches that are large enough to damage automobiles and trailers when the boat launch is used.

The boat launch is shallow and makes it difficult for boats and harvesting equipment to use.

GLIA will meet regularly with the Jackson Town Board to report on the status and condition of the boat landing.

To meet short term needs GLIA Board members will work in conjunction with the WLWC to secure funding grants on behalf of the Jackson Town Board to repair the boat launch.

In the long term, GLIA Board members will lobby with Jackson Township officials to make improvements to:

- Provide long term protection against erosion,
- install and maintain a boat wash station,
- install and maintain a boat dock.

Goal / Action	Responsible Parties	Timeline
Boat Launch repair.	GLIA Jackson Township ACLWCD	2007
Boat Launch improvements to provide long term protection against erosion.	GLIA Jackson Township ACLWCD DNR	2008-2010
Boat Launch improvements to install and maintain a boat wash station.	GLIA Jackson Township ACLWCD DNR	2008-2010
Boat Launch improvements to install and maintain a boat and handicap fishing dock.	GLIA Jackson Township DNR	2008-2010
Post and maintain signs about the presence of exotics and how to reduce the spread; about boat use patterns on the lake; and critical habitat areas that should not be disturbed.	GLIA Jackson Township DNR	2007-2010

Public Beach

The public beach is adjacent to the boat launch. It is also owned and maintained by Jackson Township. Buoys have been acquired and are placed in front of the swimming area to keep boaters away and provide a safer area for swimming.

The beach is overgrown, and is unpleasant to walk on because of the migration of coarse gravel used to repair the boat landing. The swimming area suffers from the effect of gravel erosion and migration also.

There is not garbage collection at the public beach and discarded items are often left there. Boaters and area homeowners are also leaving piles of weeds on the beach in the hopes that someone else will discard them. These factors contribute to an aesthetically unpleasing area for lake viewing and produce unpleasant odors.

Patrons of the beach have erected benches to sit on. There are no tables or other conveniences provided by the Township.

GLIA will lobby with Jackson Township to make improvements to the public beach. These improvements include:

- adding refuse collection
- adding picnic tables
- Refreshing sand on the beach

Picnic tables and refuse collection devices will be maintained by the Lake Engineer.

It is anticipated that picnic tables will need to be replaced and sand refreshed, every 7 years.

Goal / Action	Responsible Parties	Timeline
Provide a safe and nuisance free environment for swimming through the placement of buoys to designate a swimming area protected from boat traffic from the end of May to the beginning of September.	GLIA Jackson Township	2007-2010
Provide refuse collection at the Public Beach	GLIA Jackson Township	2007-2010
Provide picnic tables at the Public Beach	GLIA Jackson Township	2007-2010
Refresh sand at the Public Beach in accordance with permit regulations.	GLIA Jackson Township DNR	2007-2010

Aeration

Aeration to protect fishery

The lake will continue to be aerated in winter months to protect fish populations. There will be one aerator in operation from initial freeze to spring thaw. Another will serve as a backup. Aerator pumps will be serviced on an annual basis by inspection of worn and broken parts. Replacement parts will be ordered and repairs made by the lake engineer.

A diffuser will be added to the present aerator lines and they will be included in the maintenance plan.

Aeration to accelerate sediment degradation

Based on low oxygen levels at water depths exceeding 8 feet, year round oxygenation of deeper water depths will accelerate biodegradation of sediment. To accomplish this, homeowners will be solicited for land use to house aerator sheds, and aerator pumps at areas in the lake that will minimize aeration line lengths, while providing enough oxygenation to accelerate sediment biodegradation.

Once oxygenation is installed, sediment depth and thickness at key location will be recorded and reported on an annual basis. If no reduction in sediment is observed after the first 5 years this improvement initiative will be abandoned. If steady improvement is observed during the first 5 years, oxygenation will continue long term.

Goal / Action	Responsible Parties	Timeline
Provide an excellent habitat for fish through winter aeration of the lake to protect fish from oxygen depletion caused by rapid plant decay in the months of December – March.	GLIA	2007-2010
Reduce sediment through oxygenation.	GLIA ACLWCD DNR	2008-2012

Fishery and Aquatic Life

Most fish populations are self sustaining. A stocking of 500-700 perch was done in Fall '06. Prior to that there was northern pike and largemouth bass stocked in 1984.

Growth of northern pikes seem to be stunted by heavy vegetation and the resulting difficulty in capturing prey. Large mouth bass are in good supply. Crappie are present but in low numbers. Panfish are abundant but their growth is stunted by the effect their over populations have on the food supply.

Resident input will be a primary source of monitoring fish populations.

The Lake Management Committee members will also work with DNR to ensure that external influences on county fisheries are known and to share information specific to Goose Lake. If negative impacts to the Goose Lake fish population are suspected, committee members will lobby for more scientific approaches to inventorying fish populations and to determine the root cause of the change. They will also lobby to supplement shortfalls in the primary species through restocking.

The primary species are:

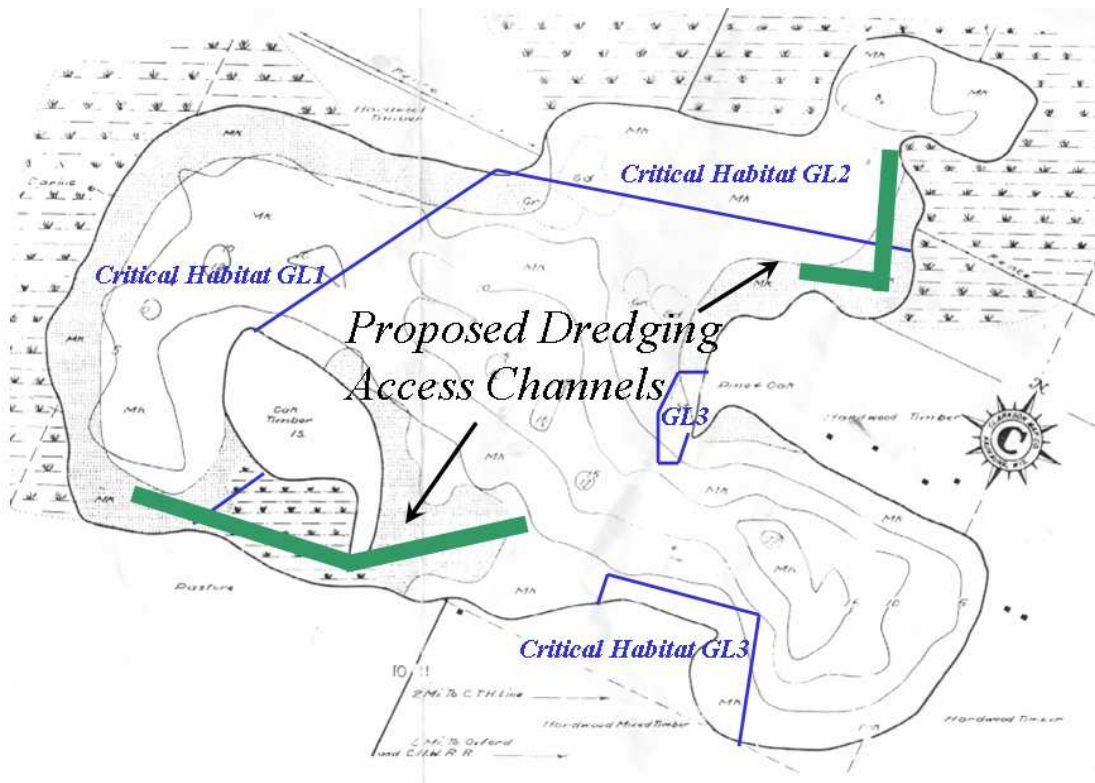
- Northern Pike
- Largemouth Bass
- Perch
- Crappie
- Panfish

Goal / Action	Responsible Parties	Timeline
Monitor fish populations through volunteer efforts and solicitation of input at GLIA general meetings in May and September each year.	GLIA DNR	2007-2010
Stock species that improve biological sustainability of fish populations	GLIA DNR	2008-2012

Channel Dredging

To improve boating access and to further protect critical habitat areas, GLIA would like to dredge channels for boating access. There are two areas that could benefit. First is along the southern shore of area GL1. Second is along the southern shore of area GL2. The drawing below depicts these areas for illustrative purposes. Exact locations will be surveyed and mapped in the future.

The boating channels will help protect the critical habitat by providing a consistent and direct route to boating areas of the lake. Impact to critical habitat areas would have to be assessed and avoided before a dredging project would be approved.



Note that the boating access channel from area GL1 will require the removal of a walkway bridge connecting the island to the southern shoreline for homeowner access to the island.

Goal / Action	Responsible Parties	Timeline
Provide benefit analysis for channel dredging.	GLIA	2007-2008
Comply with permit requirements for channel dredging.	GLIA DNR	2008
Dredge boat navigation channel for improved boat navigation for western access to the lake.	GLIA ACLWCD DNR	2009-2010
Dredge boat navigation channel for improved boat	GLIA	2009-2010

navigation for northeastern access to the lake.	ACLWCD DNR	

Funding / Lake District

Funding has been not been sufficient to allow Goose Lake Improvement Association to initiate improvements beyond winter aeration and a weed control program that targets a small portion of the lake. The lack of funding to expand weed control efforts has prevented making progress towards controlling the spread of invasive aquatic species such as Eurasian Water Milfoil. The volunteer nature of the program has achieved 35% financial participation from area residents. Residents that want other improvements and better results in weed control become disenfranchised, stop participating and exasperate the funding situation.

The Goose Lake Improvement Association relies on volunteer efforts for such activities as beach clean-up, aeration, barricade maintenance, weed control and communication.

The volunteer participation is not widespread. In order to increase the level of improvements the Association is able to make, the Association must invest time, effort and funding into programs targeted at increasing volunteerism for the additional activities.

The Association is considering the formation of a Lake District The objectives of forming the district are to:

- Include a broader audience and participation in planning activities that effect the lake and its residents
- Provide stable funding for lake improvement projects

The formation of a Lake District is a priority project for the GLIA Board of Directors.

Goal / Action	Responsible Parties	Timeline
Formation of a Lake District for Goose Lake.	GLIA	2007-2008

Capital Improvements

Capital will be required to maintain and replace existing assets and to make improvements. The current assets are:

- swimming buoys,
- aerator shed, aerator pumps, aerator lines, and aerator buoy markers,
- barricades,
- message board

When economically feasible, GLIA will purchase its own harvesting equipment. Note that there is a 50% cost share available through the DNR for all harvesting equipment. This applies to new and used harvesting equipment.

GLIA will pursue land acquisition for holding general meetings.

Goal / Action	Responsible Parties	Timeline
Perform cost / benefit analysis comparing purchase and operation of harvesting equipment to using commercial harvesting services.	GLIA	2007-2008
Acquire land and assets for conducting general meetings and for recreational use.	GLIA	2009-2012

Priorities

The project priorities are:

1. Control of EWM
2. Aeration to protect the fishery
3. Boat launch repair
4. Formation of a Lake District
5. Control of native nuisance plants
6. Aeration to reduce sediment
7. Public beach improvements
8. Shoreline buffer zone education and protection
9. Boat launch improvements
10. Channel dredging
11. Fishery monitoring
12. Land acquisition and other capital improvements

Timeline

ID	Task Name	2007					2008					2009					2010					2011					2012				
		Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4					
1	Control of EWM																														
2	Aeration to protect fishery																														
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6	Aeration to reduce sediment																														
7	Public Beach Improvements																														
8	Boat Launch Improvements																														
9	Shoreline buffer zone education and protection																														
10	Channel Dredging																														
11	Fishery Monitoring																														
12	Land acquisition and other capital improvements																														

Appendix A

THE AQUATIC PLANT COMMUNITY FOR GOOSE LAKE, ADAMS COUNTY 2006.

Appendix B

CRITICAL HABITAT DESIGNATION FOR GOOSE LAKE, ADAMS COUNTY 2006

Appendix C

Management Options for Aquatic Plants